

Supplemental File 1. Data Charting Table

Author	Year	Location	Study design	Sample size and age (M±SD)	Sleep measure	Sleep hygiene-related intervention	Findings
Sleep hygiene strategy	All sleep hygiene strategies						
	Emery et al.	2014	Canada	Multi-component study including qualitative interviews, cross-sectional survey, and observational data	60 (44 female) adults with and without major depressive disorder. Age 46.0±9.2 years.	Cross-sectional component of study included the completion of the SHAPS, PSAS, and the PSQI. Participants also completed daily sleep diaries.	Reporting on sleep hygiene practices
							PSQI (p>0.10) MDD group: 15.48(±3.68) Non-MDD group: 14.84(±4.06)
							SHAPS (p=0.06) MDD group: 35.61(±15.30) Non-MDD group: 28.31(±13.80) PSAS – somatic (p=0.070) MDD group: 16.38(±5.12) Non-MDD group: 14.12(±4.27) PSAS – cognitive (p=0.009) MDD group: 21.11(±7.66)

Walker et al.	2010	United States	Cross-sectional observational design	51 adolescents (22 female) receiving chemotherapy treatment for cancer. Aged 14.2±2.7 years. Compared to a sample of 20 healthy norms.	ASHS, 7-day sleep diary	Outcomes compared on the Adolescent Sleep Hygiene Scale	Non-MDD group: 16.44(±5.30) Sleep environment subscale (p≤.001) Cancer group: 5.0(±0.9) Healthy controls: 5.5(±0.6) Sleep stability subscale (p≤.001) Cancer group: 3.7(±1.1) Healthy controls: 4.3(±0.7) ASHS total score (p≤.001) Cancer group: 4.7(±0.5) Healthy controls: 5.0(±0.4)
Berry et al.	2015	Canada	Sleep education Between-subject randomised controlled trial	85 (52 female) patients with non-cancer pain randomly allocated	Intervention group with one-on-one didactic	Intervention consisted of one-on-one didactic sleep	Sleep latency (week 4)* (p < .02)

				to a treatment group (<i>n</i> =44, aged 50.4±10.4 years) or a control group (<i>n</i> =41, aged 48.5±11 years).	session including practical steps for improving sleep, control group.	hygiene sessions with practical steps for improving sleep.	Sleep hygiene group: 93.9 (±42.6) mins Control group: 118.4 (±45.1) Sleep quality (week 4) Sleep hygiene group: 2.8 (± 0.8) Control group: 2.9 (±0.7) Time in bed (week 4) Sleep hygiene group: 7.5 (±1.6) Control group: 7.2 (±1.1)
Napping - <i>no articles found</i>							
Consistent bed and wake time - <i>no articles found</i>							
Andrews et al.	Exercise 2014	Australia	Observational, prospective, within-person study design	50 (30 female) patients with non-cancer related chronic pain. Aged 54.2±10.7 years.	Activity monitor and questionnaire completion over five days	Comparison of daily physical activity and sleep outcomes	Higher daytime activity associated with greater overnight wakefulness

							(β =.29, t 88.84=2.09, P =.04, 95% CI=0.0015 to 0.06)
Asih et al.	2014	United States	Prospective within-subject study design	262 (87 female) patients with chronic disabling occupational musculoskeletal disorders. Aged 44.9±10.9 years.	ISI	Quantitatively directed exercise progression program including approximately 4-6h activity per day over 4-8 weeks.	53.4% of participants moved to a lower category on the Insomnia Severity Index at the end of treatment.
Evans et al.	2013	United States	Exploratory randomised usual-care waitlist-control design	26 female patients with rheumatoid arthritis, aged 28.3±3.9 years.	Weekly rating of trouble with sleeping	Participation in yoga program. Data collected at three timepoints (baseline, post-treatment, 2 month follow up)	No significant differences in sleep outcomes for participants in the yoga group (p = .100)
Hall et al.	2019	United States	Prospective baseline, pre- and post- intervention design	33 (25 female) patients at a pain management clinic, aged 51.4± 11.3 years.	SPI II completed baseline, pre- and post-intervention	Participation in a 10-week yoga program. . One third of participants (N = 11) completed pre-	SPI II Baseline (N = 33): 50.9 ± 21.3 Pre-intervention (N = 27): 49.4 ± 20.5

Jones et al.	2012	United States	Parallel-group randomised controlled trial	98 (91 female) individuals diagnosed with fibromyalgia. Average age 54 years (no SD provided, range 40.7-74.1 years).	PSQI	and post-intervention measures. 8-form Yang-style Tai chi program compared to an education control	Post-intervention (N = 11): 37.9 ± 23.1 PSQI global score Tai chi group: -2.0 points Control group: 0.03 points
McGovney et al.	2020	United States	Observational, prospective, within-person study design	160 (150 female) participants diagnosed with fibromyalgia who reported insomnia complaints. Aged 52.4±11.7 years)	Actigraphy	14-day data collection of usual physical activity	Reduced total sleep time, sleep latency, wake after sleep onset, and sleep efficiency after afternoon activity, (p < .001 for all variables), and early evening activity (p < .001 for all variables)
Nguy et al.	2020	Australia	Observational cross-sectional design	52 (16 female) participants with Parkinson's disease, aged 67.8±7.8 years.	PSQI and actigraphy	7-day data collection of usual physical activity, sleep, and pain	Increased physical activity associated with increased pain (p<.05) Poor sleep associated with

Skarpsno et al.	2018	Norway	Longitudinal design	21, 847 participants (11,909 female) with and without chronic pain. Age of chronic pain group ($n=5305$) 47.6 ± 12.0 , age of no chronic pain group ($n=6605$) 47.6 ± 12.0 (overall sample mean not provided)	Questions on insomnia symptoms	Historical data of a sample of the general population including measures of chronic pain, physical activity, and insomnia at baseline (1955-97) and followed up in 2006-08.	increased pain ($p<.05$) No combined effect of physical inactivity and ≥ 5 pain sites on risk of insomnia (RERI: 0.88 (95% CI: $-.085$, 2.60)) With 1-4 pain sites, physical activity resulted in a lower risk of insomnia ($p<0.05$).
Tang et al.	2014	United Kingdom	Observational cross-sectional design	119 (88 female) patients with chronic pain and insomnia, aged 46.0 ± 10.9 .	Sleep diary and actigraphy	7-day data collection of usual sleep and physical activity	Sleep quality predicted physical activity ($p=.017$)
Wiklund et al.	2018	Sweden	Randomised controlled trial	185 (participant sex not reported) patients with chronic benign neck, low back, and/or generalized pain, aged 54.2 ± 10.2 years.	ISI	Participants randomly allocated to complete 7-8 weeks of treatment (exercise or stress management) or control).	Post-intervention ISI *= significantly different from baseline measurement ($p<.05$) Exercise group: $11.19 \pm 6.27^*$ Stress management

							group: 12.22 ± 6.38*
							Control group: 12.59 ± 7.13
Graham & Streitel	Alcohol use 2010	United States	Cross sectional design	362 (265 females) participants, aged 20.6±1.6 years, with chronic pain (<i>n</i> =108) and without chronic pain (<i>n</i> =254).	PSQI	Participants completed a survey on usual experience of chronic pain, and usual sleep quality and alcohol use	Alcohol use predicted poor sleep quality <i>b</i> = .29, <i>p</i> <.01
Miller et al.	2018	United States	Observational, prospective, within-person study design	73 adults (68 women) reporting symptoms of chronic pain and insomnia related to fibromyalgia, aged 51.3±12.0 years.	Sleep diary	14-day data collection of usual alcohol use and sleep patterns	Each alcoholic drink consumed resulted in an increased sleep latency of 5.0 minutes.
Burris et al.	Tobacco use 2013	United States	Cross-sectional design	48 (all female) patients experiencing orofacial pain, aged 41.1±13.3 years.	PSQI	Retrospective chart review of new-patient questionnaires on sleep quality, and smoking behaviour.	PSQI global score* (<i>p</i> >.05) Non-smokers: 1.44 (1.08) Smokers: 2.00 (0.93)

Khan et al.	2019	United States	Longitudinal design	8584 patients attending the Stanford Pain Management Center from 2013-2017. Participants split into smokers ($n=727$) aged 47.9 ± 12.9 years, and non-smokers ($n=5254$) aged 49.4 ± 16.5 years (overall sample age not provided).	PROMIS	Participants completed PROMIS (with sleep and smoking-related questions) at two time points: baseline, and time 2 (6-8 weeks following baseline) after they have received a range of recommendations for pain management.	Sleep disturbances significantly worse in smokers than non-smokers at baseline and time 2: $p < .001$
Stipelman et al.	2013	United States	Cross-sectional design	22,850 (11,640 females) participants from the National Interview Survey. Aged 18+ (mean age not provided) Participants were split into 2 groups, those with a chronic rheumatic condition causing pain ($n=1417$ females)	Questions on sleep duration from the National Health Interview Survey	Questions from the National Health Interview Survey on usual smoking behaviour.	Reported <6h sleep/night Smokers: 25.4 % Non-smokers: 15.2%

and those without a chronic rheumatic condition (n=11, 224 females)								
Caffeine - no articles found								
Pre-bed alerting activities (e.g., video games, internet) - no articles found								
Pre-bed state (e.g., stress, anger, worry, rumination)								
Brintz et al.	2020	United States	Mixed-methods, single-group, pre-post design	23 adults (17 female) experiencing non-cancer chronic pain, Mean age 53 years (no SD provided).	PSQI and actigraphy	Participants completed four weekly sessions of mindfulness-based stress reduction	Sleep disturbance* (p>.05) Pre-intervention: 56.52 (±7.79) Post-intervention: 51.83 (±9.75)	
Brown et al.	2014	Canada	Case series study	12 patients (9 women) with a diagnosed musculoskeletal condition and self-reported problems with sleep, aged 58.4±9.5 years.	PSQI and actigraphy	Participants completed 7-days of baseline data collection, were taught a hand self-Shiatsu method, and completed two follow ups (2 and 8 weeks)	No significant differences in PSQI or actigraphy outcomes from baseline to follow up (no figures reported).	
Byers et al.	2016	United States	Cross-sectional design	48 adults (36 female) with chronic pain,	ISI	Participants completed a	13% of variance in scores on ISI	

				aged 51.6±11.9 years.		questionnaire on pain, cognition, and sleep.	explained by cognitive and somatic scores on the PSAS (p=.001)
Chen & Francis	2010	Australia	Randomised controlled trial	19 participants (13 female) with current chronic pain, aged 39.3±13.0 years).	VAS relating to sleep quality	Participants completed 1 week of baseline data collection followed by 6 weeks of either treatment (abbreviated progressive relaxation technique and guided imagery intervention) or control.	Sleep quality VAS ratings Intervention group: 75% of participants saw improvement Control group: 28.57% of participants saw improvement
Dillon et al.	2012	United States	Cross-sectional	48 adult (36 female) outpatients with chronic pain, aged 51.6±11.9 years.	ISI	Inter-group comparison of cognitive and somatic pre-sleep arousal, based on Insomnia Severity Index (ISI) scores.	PSAS item “worry about falling asleep”* (p<.05) Participants with moderate – severe ratings on ISI: 3.2(±1.6)

							Participants with mild ratings on ISI: 2.3(±1.2)
Esmer et al.	2010	United States	A single-center, prospective, randomized, singleblind, parallel-group clinical trial	25 (11 women) patients with persistent leg pain, back pain, or both. Participants assigned to intervention ($n=15$, aged 55.2 ± 11.2 years) or control ($n=10$, aged 54.9 ± 9.5 years). Overall mean age not provided.	PSQI	Participants allocated at baseline to receive mindfulness-based stress reduction therapy or a control for 8-weeks.	Abridged PSQI Intervention group: 2.4 (±0.8) Control group: 2.3 (±0.9)
Innes et al.	2018	United States	Randomised controlled trial	22 (15 female) adults with symptomatic knee osteoarthritis pain, aged 58.5 ± 1.4 years.	PSQI	Participants randomised to a mantra meditation or a music listening program for 8 weeks.	PSQI global score ($p = .23$) Meditation group: 9.78 (±3.24) Music listening group: 8.09 (±2.21)
Linton et al.	1985		Three group pre- and post-test design	28 (15 female) participants with current pain in back or joints. Participants were randomly allocated to a waiting list control ($n=10$, age mean	Questions on sleep latency, quality, and number of awakenings which were combined	Comparison of waitlist control, regular treatment, and behavioural treatment (including applied	Significantly greater improvements seen in the behavioural treatment group compared with waitlist control

				39.2 years, no SD provided), regular treatment ($n=10$, age mean 37.6 years, no SD provided), or behavioural training and regular treatment ($n=8$, age mean 43.1 years, no SD provided)	into one overall sleep outcome metric.	relaxation) groups ,	($p=.020$) and regular treatment ($p=.049$).
Morone et al.	2008	United States	Qualitative design	27 adults (14 female) with chronic lower back pain, aged 74.3 ± 5.3 years.	Diary with qualitative data on sleep	8-week mindfulness meditation program.	Main themes: <ul style="list-style-type: none"> • Pain reduction Improvement in attention skills <ul style="list-style-type: none"> • Improved sleep • Wellbeing • Barriers to meditation • Processes of meditation
Valrie et al.	2007	United States	Prospective observational study	20 children (13 female) with sickle cell disease, mean age 10.1 ± 10.1 years.	VAS relating to sleep quality and sleep duration	Daily diary study in children with sickle cell disease.	Greater stress during the day associated with shorter sleep periods ($\beta = -0.13$, $p = .04$)
Zaidel et al.	2021	United States	Cross-sectional design	4,201 (2,827 females) adults with	PSQI	Participants completed a	Sleep quality ($p<.001$)

diagnosed back pain, osteoarthritis, and/or rheumatoid arthritis, aged over 65 years (no mean or SD provided).	survey on sleep and daily stress.	Low stress: 50.2 (poor sleep quality); 73.3 (good sleep quality) Medium stress: 41.9 (poor sleep quality); 24.5 (good sleep quality) High stress: 7.7 (poor sleep quality); 1.5 (good sleep quality) Sleep duration (p<.001) Low stress: 74.8 (poor sleep duration); 67.0 (good sleep duration) Medium stress: 23.4 (poor sleep duration); 29.7 (good sleep duration) High stress: 1.3 (poor sleep duration); 2.5
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Use of bed for activities other than sleep or sex - <i>no articles found</i>								
Uncomfortable bed/bedding - <i>no articles found</i>								
Sleep environment (e.g., light, heat)								
Burgess et al.	2018	United States	Single-arm trial	37 (10 females) veterans with diagnosed chronic lower back pain, aged 48.4±14.1 years.	PSQI and actigraphy	Participants completed a 7-day baseline followed by 13 days of a 1-hour morning bright light treatment self-administered at home.	Total sleep time Pre-intervention: 402.47 (±75.66) mins Post-intervention: 383.40 (±67.46) mins Bedtime* (p>.05) Pre-intervention: 23:25 (±1.80) Post-intervention: 22:55 (±1.75) Dim light melatonin onset (DLMO)* Pre-intervention: 19:58 (±1.57) Post-intervention: 19:11 (±1.46)	

Pre-bed work - *no articles found*

Pre-bed routine - *no articles found*

Note. M – Mean. SD – Standard Deviation. SHAPS – Sleep Hygiene Awareness and Practice Scale; PSAS – Pre-Sleep Arousal Scale; PSQI – Pittsburgh Sleep Quality Index; MDD – Major Depressive Disorder; ASHS – Adolescent Sleep Hygiene Scale; VAS – Visual Analogue Scale; SPI II – Sleep Problem Index II; ISI – Insomnia Severity Index; PROMIS – Patient Reported Outcomes Measurement Information System; DLMO – Dim Light Melatonin Onset.

